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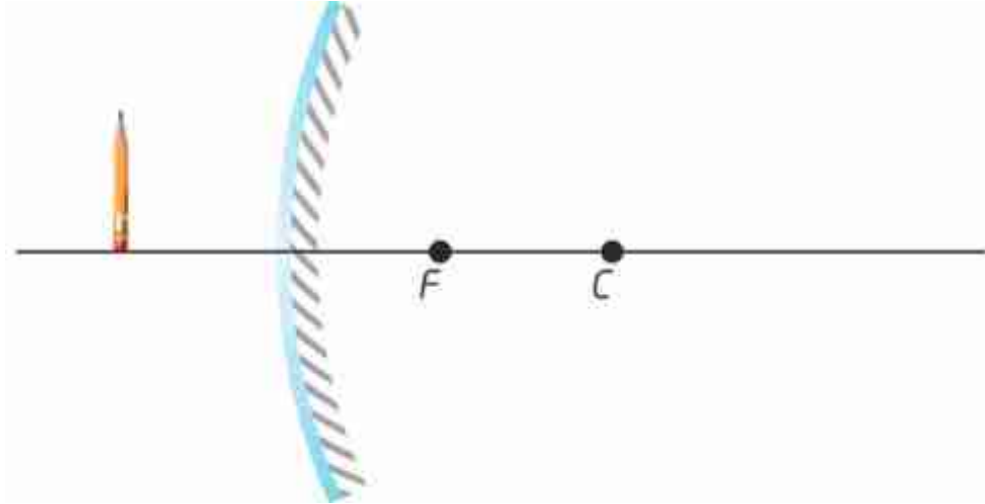
Name: _____ Date: _____

MCR3U

Unit 4 Test: Optics

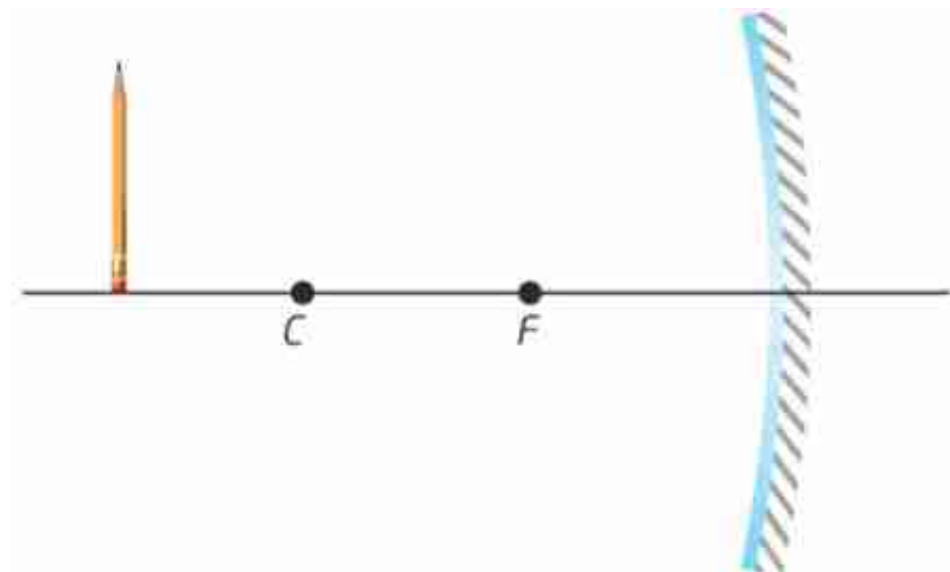
/4
K

1. Using the diagram below, draw the appropriate incident and reflected rays to help you predict where the image will lie. Be clear about where the image is!



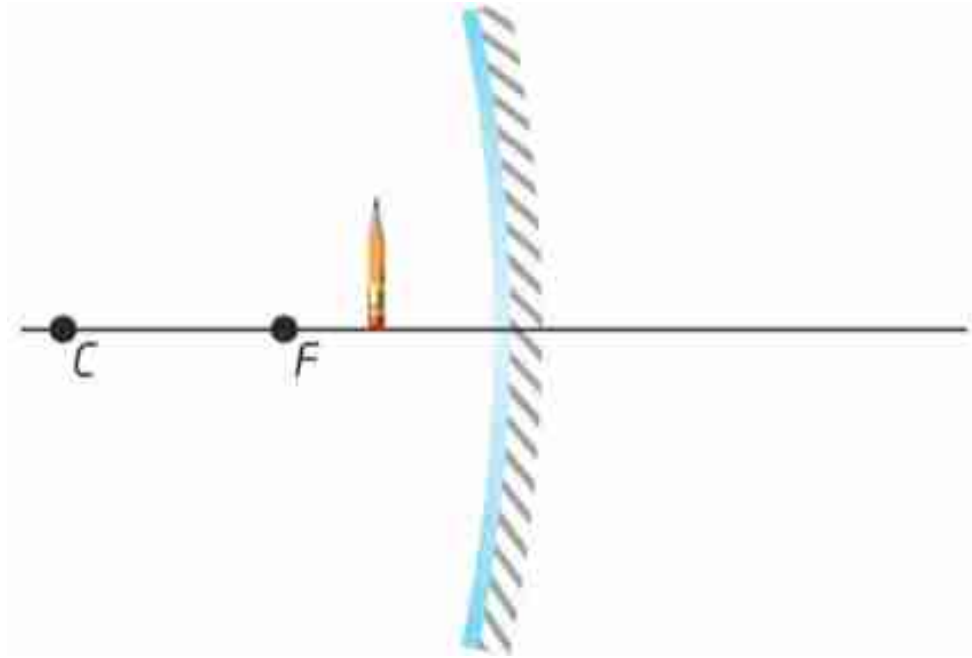
/4
K

2. a) Using the diagram below, draw the appropriate incident and reflected rays to help you predict where the image will lie. Be clear about where the image is!



/4
A

3. Using the diagram below, draw the appropriate incident and reflected rays to help you predict where the image will lie. Be clear about where the image is!



/3
A

4. The mirror shown above, has $f = 8$ cm. The pencil (4-cm tall) is placed 6 cm from the mirror.

a) Use the mirror equation to find the image distance.

/2
C

b) Why is the image distance negative?

c) The image height in this question is **positive**. Is the image upside-down or right-side-up?

/8
K

5. Define each of the following terms.

| | |
|-------------------|--|
| Chemiluminescence | |
| Gamma Rays | |
| Incandescence | |
| Refraction | |
| Virtual Image | |
| Bioluminescence | |
| Convex Mirror | |
| Phosphor | |

/5
T

6. A 10-cm tall apple sits 20 cm away from a concave mirror with $f = 15$ cm.

a) What is the image distance?

b) What is the image height?

/2
C

7. Explain how total internal reflection is used in fibre optic cables.

/2
C

8. Explain how **rainbows** form immediately after a rainstorm. Use the term **index of refraction**.

/3
C

9. Imagine that you and a friend are hiking across a hot desert. Your friend believes that he sees a pool of water and starts to run towards the water. How could you convince your friend not to exert himself unnecessarily? In your explanation, include a description of the different indices of refraction of the layers of air of different temperatures.

Put another way: Explain how mirages form.

/2
A

10. What is the speed of light in a medium with $n = 1.56$?

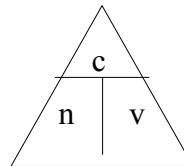
/2
A

11. What is the index of refraction if the speed of light in the medium is $1.77 \times 10^8 \text{ m/s}$

Formulas

$$n = \frac{c}{v}$$

$$c = 3.0 \times 10^8 \text{ m/s}$$



Mirror Equation

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$$

f is the focal length (negative for convex mirror)

d_o is the object distance (how far the actual object is from the mirror)

d_i is the image distance (how far the image of the object is from the mirror). Negative if the image is behind the mirror.

$$f = \frac{d_i + d_o}{d_i d_o}$$

$$d_i = \frac{d_o - f}{d_o f}$$

$$d_o = \frac{d_i - f}{d_i f}$$

Magnification Equation

$$m = \frac{h_i}{h_o} = \frac{-d_i}{d_o}$$

m is the magnification

d_o is the object distance

d_i is the image distance (negative if the image is behind the mirror)

h_o is the object height

h_i is the image height (negative if the image is inverted)

$$h_i = \frac{-d_i h_o}{d_o}$$

$$h_o = \frac{-h_i d_o}{d_i}$$

$$d_i = \frac{-h_i d_o}{h_o}$$

$$d_o = \frac{-d_i h_o}{h_i}$$